REDUCING SHIPPING ERRORS IN FOOD DISTRIBUTION WAREHOUSES — AN EVALUATION OF METHODS USED BY SEVEN FOOD DISTRIBUTORS

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PREFACE

Methods used to reduce shipping errors at food distribution warehouses are part of a broad program aimed at reducing the cost of marketing farm products. One phase of this research is the development of methods for increasing efficiency of food wholesaling.

Special acknowledgment is due H. E. Butt Grocery Company, Corpus Christi, Tex.; The Golub Company, Schenectady, N.Y.; The Grocers Supply Company, Houston, Tex.; Super Valu Stores, Inc., Hopkins, Minn.; and Wakefern Food Corporation, Elizabeth, N.J.

This study was conducted under contract by R. M. Winslow, Management Consultant, Minneapolis, Minn. The contract was administered by Jack L. Runyan, Marketing Specialist, Food Distribution Research Laboratory, Agricultural Marketing Research Institute, Northeastern Region, Agricultural Research Service, U.S. Department of Agriculture.

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REDUCING SHIPPING ERRORS IN FOOD DISTRIBUTION WAREHOUSES—AN EVALUATION OF METHODS USED BY SEVEN FOOD DISTRIBUTORS

By R. M. Winslow and Jack L. Runyan 1/

SUMMARY

Outbound checking is an added function and cost used to determine the accuracy of the warehouse selection and shipping operations. This checking is a base for issuing credits or debits to the retail store for the errors found.

Most food distributors do some type of checking at the warehouse. The type of checking at warehouses varied from a complete item check to an occasional spot check when problems occur.

Among the seven warehouses studied, the cost of outbound checking varied from 1.428 man-hours to 0.027 man-hour per 1,000 cases shipped. With an average hourly wage cost of $9 per hour, including fringe benefits, this means $12.86 to $0.24 per 1,000 cases shipped.

The type of checking at the retail store also varied ranging from a complete piece count by both the driver and retail clerk on delivery, to a no checking on unit pallet load deliveries.

Based upon the material presented, the following recommendations can be made:

- Determine the reasons for shipping errors and correct the errors to secure selection accuracy.
- Check orders at the warehouse on a quality control basis and structure the quality control by:
  - Setting the range of quality required (be realistic and not idealistic).
  - Taking a random sample.

1/ Respectively, Management Consultant, Minneapolis, Minn. 55416, and Marketing Specialist, Food Distribution Research Laboratory, Agricultural Marketing Research Institute, Northeastern Region, Agricultural Research Service, U.S. Department of Agriculture, Beltsville, Md. 20705.

- Varying the size of the sample (percentage of total shipments) with the degree of error—the larger the number of errors, the larger the sample.

- Determining the cause of current errors and taking preventive action.

- Make arrangements with retail stores so that credits for errors are based on the percentage of errors found in the quality control procedure.

- The cost of checking orders must never exceed the value of the errors found.

INTRODUCTION

Quality control is very important in most manufacturing operations. A manufacturer must maintain a high level of quality or performance in his product or eventually he will lose to his competitor. The manager of a food distribution warehouse is in business to provide supplies and services to his retail customers. One of the key qualities that a manager of a food distribution warehouse must provide is service reliability. In other words, a retail customer expects to receive the products he ordered in the correct amount, on a specified day, and at a specified time.

Filling orders with minimum of errors is an important part of maintaining reliable services. When filling orders, errors that are not corrected before shipment is made are called shipping errors. Shipping errors reduce the level of service reliability and lead to: (1) Added costs of checking orders to determine and correct the errors made during selection and (2) added costs of giving credits to retail stores for shortages on delivery.

At a warehouse seminar conducted in October 1975 by the National-American Wholesale Grocers' Association, 54 firms reported that they used an average of 3.2 percent of their total paid warehouse hours for outbound order checking. The same 54 firms reported they used 29.6 percent of their total paid warehouse hours for order selecting or about 10 times as much as for order checking. The average labor cost for the firms reporting at the seminar was $0.16 per case. At 3.2 percent of total labor costs, the cost of outbound order checking amounted to over ½ cent per case shipped. In a typical warehouse 2/ a ½ cent per case cost would amount to approximately $52,000 per year which is a substantial warehouse cost factor.

Therefore, it is important that the warehouse operation have a high level of order-filling accuracy at a low-controlled cost to both the food distribution warehouse and the retailer.

2/ A warehouse from which 200,000 cases are shipped per week.

OBJECTIVES

The objective of this study was to determine the causes of shipping errors made at food distribution warehouses and to develop recommendations for reducing the number of errors. More specifically the objectives were to determine and evaluate:

1. Types and causes of shipping errors that occur most often.
2. Methods used to reduce shipping errors.
3. Methods used to check orders.
4. Costs for checking orders.

APPROACH

To accomplish the objectives of this study: (1) Information was gathered from past records and from informal interviews to determine the shipping errors made most often; and (2) methods used at seven food distribution warehouses to reduce the amount of shipping errors were evaluated.

TYPES AND CAUSES OF SHIPPING ERRORS THAT OCCUR MOST OFTEN

Three types of shipping errors that occur most often are shortages, overages, and mis-selection. Shortages are failures to select and load all of the cases ordered. The frequency of these errors increases for the multicase items (more than one case of an item per order). Overages are selecting and loading more cases than ordered. The frequency of these errors also increases as for multicase items. Mis-selection is selecting and loading a different item from the item ordered.

The many causes of shipping errors are as follows:

- Poorly trained warehousemen (both order selectors and checkers).
- Overemphasis on quantity of production (output) rather than the quality of production.
- Poorly prepared or structured documents provided to order selectors to tell them what products they should select.
- Improper pallet "let-down" policy (filling selection slots from reserve storage) or performance by forklift operators.
- Merchandise placed in the wrong selection slot by forklift operators.
- Inadequate lighting.

All of the above causes of shipping errors have one thing in common—they are controllable. While 100 percent elimination of the shipping errors would be unlikely, proper correcting of these causes would greatly reduce the number of shipping errors.

METHODS USED TO REDUCE SHIPPING ERRORS

The best method for reducing errors is to prevent them from occurring. Correcting the conditions that can cause shipping errors can be obtained by providing:

- Training programs for new employees.
- Periodical refresher courses for veteran employees and supervisors.
- Proper lighting which would make easier reading of orders, slot numbers, and case markings.
- Properly prepared documents for order selectors. These documents should feature: (1) Slot number—where the item is located; (2) quantity—amount of item ordered; (3) description—readable item abbreviations; and (4) manufacturers case code number, if available.

In many food distribution operations, adhesive case labels containing slot number, quantity, item description, and other information are used to aid in order selection accuracy. 3/ An adhesive label is printed for each case on the order. The label is placed on the case as it is selected. For multicase items (usually over 10 cases), the case label is often printed in a special list and handled in a special way. Labels for items that are not available for selection (warehouse scratches) are kept on the paper strip and used as the basis for credits to the store.

A method used in conjunction with adhesive case labels is the unit load cube method. In this method, orders are divided into unit loads (either pallet or cart loads) by the cube of the number of cases to be included in the unit load. Each unit load is identified by an alpha letter that appears on the adhesive case label. Each unit load can be spot checked or visually checked to detect any selection errors or any unit load which varies from the standard set. A copy of the grocery load sheet (adhesive labels) is maintained in the office (fig. 1).

The information on the sheet shown in figure 1 is: (1) Store identification number (23); (2) labels showing pallet identification (under "cart") 4/

3/ For a more detailed discussion of adhesive labels see Use of Adhesive Labels for Price-Marking Cases at the Grocery Warehouse. U.S. Dept. Agr., Agr. Res. Serv., ARS 52-23, 19 pp. 1967.

4/ The firm using the method illustrated in figure 1 uses the same label structure for all orders. Therefore, the heading "carts" appears whether carts or pallets are used.

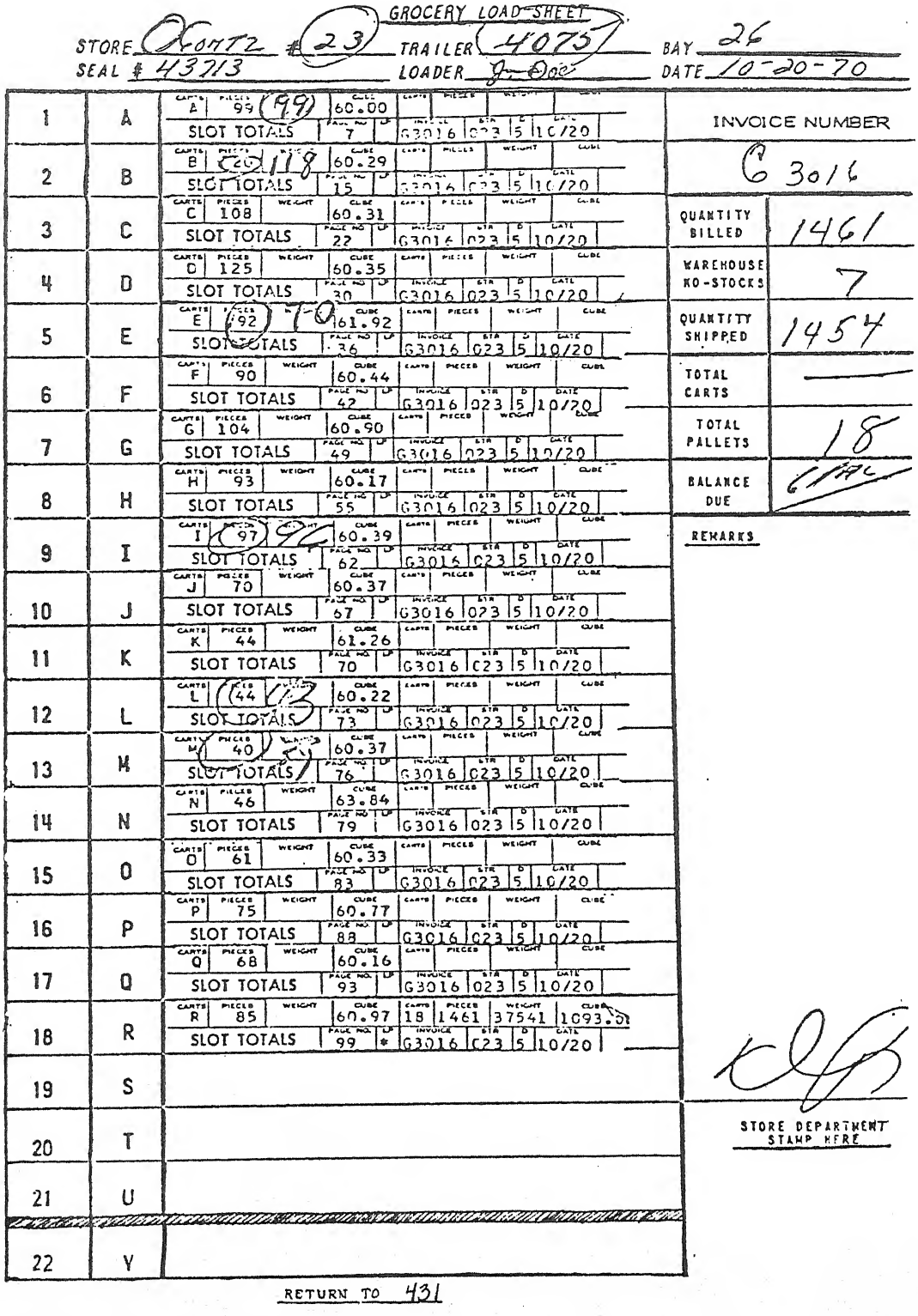

Figure 1.—Sheet of gummed labels used for the unit load cube method of reducing shiiping errors.

A through R, number of pieces (cases) on each pallet, cube of cases on each pallet, invoice page number (7 on label A), invoice number (G3016), store number (023), department number (5), and date 10/20); (3) the last label (label R in this example) shows (on the top line) total number of pallets (18), total number of pieces (1,461), total weight (37,541), and total cube (1,093.67 of merchandise only); (4) a recap of the shipment telling the retailer what actually is on the truck—quantity billed (1,461), warehouse no-stocks (7), quantity shipped (1,454), total pallets (18); and (5) remarks.

The labels for the seven warehouse no-stocks (shown in fig. 1) are placed on a separate grocery no-stock tally sheet and a copy is returned to the office (fig. 2). Slot number, item description, pack (number of units per case) pallet number (under "MFR. No."), store number, and date are all included on the labels shown in figure 2. The store (number 23) will be credited for the items appearing in figure 2.

A copy of the information shown in figure 2 will also go to the retail store with the shipping documents. The retailer is informed immediately of shortages rather than being surprised when the carts are unloaded and the merchandise is placed on display.

METHODS USED TO CHECK ORDERS

Checking orders (verification of accuracy) is the method used to find and correct shipping errors. Checking orders can be performed at the warehouse, at the retail store, or at both locations. The amount and type of checking orders are affected by the method of loading at the warehouse and unloading at the retail store.

Checking Orders at the Warehouse

At the warehouse merchandise is loaded into delivery vehicles by: (1) Dead piling on the floor of the vehicle; (2) delivery carts; (3) pallets, or (4) load transfer plywood sheets. Order checking procedures used with each method of loading merchandise on to delivery vehicles will be discussed.

In the dead piling on the floor of the vehicle, five procedures (assuming no checking to be a procedure) can be used to check orders. One procedure is complete item check, where each case of product is verified with the order. A second procedure is partial item check, where a predetermined number of cases (every 10th case) is verified with the order. A third procedure is complete piece count, where each case is counted as it is loaded into the delivery vehicle. The complete piece count is much faster than the complete item check because the former requires only total number of cases loaded and total number of cases ordered (with adjustments for no-stocks) be the same. A fourth procedure is partial piece count where for every fifth order the pieces would be counted. The fifth procedure, no checking, is not recommended.

GROCERY NO-STOCK TALLY

STORE NAME Quartz DEPT. NAME GRC DATE 10-20-70 INVOICE NO. G3016

STORE NO. 23 DEPT. NO. 5 TRAILER NO. 4075 TOTAL NO-STOCKS 7

THE FOLLOWING ITEMS WERE NOT AVAILABLE. YOU WILL RECEIVE CREDIT.

57008 SLOT	CASE 2	SIZE AND DESCRIPTION 1LB5½OZ COMET CL					CLS-CODE 366460	SUGG. RETAIL PRICE 23			
	OF 2	MFR. NO. M	PACK 30	STR 023	D 5	DATE 10/20					
57005 SLOT	CASE 1	SIZE AND DESCRIPTION 1LB5½OZ COMET CL					CLS-CODE 366460	SUGG. RETAIL PRICE 23			
	OF 2	MFR. NO. L	PACK 30	STR 023	D 5	DATE 10/20					
25187 SLOT	CASE 1	SIZE AND DESCRIPTION 4 OZ ROY CHOC PU					CLS-CODE 414120	SUGG. RETAIL PRICE 10			
	OF 2	MFR. NO. B	PACK 24	STR 023	D 5	DATE 10/20					
25187 SLOT	CASE 2	SIZE AND DESCRIPTION 4 OZ ROY CHOC PU					CLS-CODE 414120	SUGG. RETAIL PRICE 10			
	OF 2	MFR. NO. R	PACK 24	STR 023	D 5	DATE 10/20					
47288 SLOT	CASE 1	SIZE AND DESCRIPTION 153/8OZ CHEF CHEE					CLS-CODE 476200	SUGG. RETAIL PRICE 57			
	OF 1	MFR. NO. I	PACK 18	STR 023	D 5	DATE 10/20					
34435 SLOT	CASE 1	SIZE AND DESCRIPTION 15 OZ CAN F C KAL					CLS-CODE 465920	SUGG. RETAIL PRICE 17			
	OF 1	MFR. NO. E	PACK 24	STR 023	D 5	DATE 10/20					
37248 SLOT	CASE 1	SIZE AND DESCRIPTION 8 OZ DEVON FLAT					CLS-CODE 515440	SUGG. RETAIL PRICE 29			
	OF 1	MFR. NO. E	PACK 24	STR 023	D 5	DATE 10/20					

LOADER'S SIGNATURE John Doe

Figure 2.—Grocery no-stock tally used with gummed label and unit load cube method for reducing shipping errors.

In the delivery carts method, the same procedures are used as in the dead piling method. Order checking in the delivery carts method is much faster when carts are loaded so all cases are visible than when carts are loaded so cases are not visible.

Checking orders and the pallet method for loading delivery vehicles are incompatible. Many of the pallet loads cannot be accurately checked without breaking down the pallet load. Because breaking down the pallet load is very costly, usually minimal, if any, order checking is done. If pallet loads are selected on a unit load cube basis (see unit load cube on page 4), the general shape and size of the load can give a partial check.

Order checking is also incompatible with load transfer plywood sheets method of loading delivery vehicles. As with the pallet method, the only way to check load transfer plywood sheets is the costly process of breaking down the load.

Checking Orders at the Retail Store

At the retail store the procedures for checking orders depend on the method used for unloading the delivery vehicle and the preference of the retail store manager. The discussion that follows will be limited to the unloading methods because retail managers will presumably check all items after the delivery vehicle has departed.

When the dead piling method is used to load delivery vehicles, a case by case unloading method (roller conveyor or handtruck) must be used. Both the delivery vehicle driver and retail store clerk count cases while unloading. One method to aid with piece counting during case by case unloading is to verify the count after each 25th case. Otherwise, there would be considerable room for confusion, as in a 1,200-case delivery. To aid in verifying the count after each 25th case (verification could take place after any case, such as the 10th, the 15th, and the 50th), a form such as the one in figure 3 could be used.

In the delivery carts method, the carts are used for loading and unloading delivery vehicles. The big savings with carts is in the speed of loading and unloading delivery vehicles. Therefore, order checking while unloading should be kept to a minimum.

In the pallet method for loading delivery vehicles, either a case by case unloading method or a pallet unloading method is used. If the case by case method of unloading is used, the order checking procedure is identical to that of the dead piling loading method. The pallet unloading method like the pallet loading method is incompatible with order checking. No order checking is done while the driver and the delivery vehicle are at the store. Otherwise, much of the value of the unit pallet load delivery would be lost.

In the load transfer plywood sheet method for loading delivery vehicles, the case by case unloading method has to be used. Therefore, the same order checking procedures are used as those in the dead piling method.

GROCERY DIVISION

STORE _____ DATE _____

UNLOADING BY PALLETS

		CONT. TOTAL
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12.		
13		
14		

		CONT. TOTAL
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
TOTAL		

TALLY SHEET

_____

RECEIVER'S NAME

UNLOADING BY ROLLERS (CIRCLE EVERY 25 PIECES)

25	50	75	100	125	150	175	200	225	250	275	300
325	350	375	400	425	450	475	500	525	550	575	600
625	650	675	700	725	750	775	800	825	850	875	900
925	950	975	1000	1025	1050	1075	1100	1125	1150	1175	1200
1225	1250	1275	1300	1325	1350	1375	1400	1425	1450	1475	1500
							TOTAL				

COMMENTS: _____

_____

_____

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Figure 3.—Example of an order verification form used to check orders during delivery vehicle unloading.

COSTS FOR CHECKING ORDERS

In addition to the cost for checking orders at the food distribution warehouse, there is also a cost to both the distributor and the retailer for order checking at the retail store. In many instances there is case by case unloading over roller conveyors where each 25th case is verified by both the driver and the retail clerk. When checking is part of the unloading operations, the added cost is minimal.

When groceries are received at the retail store in pallet or cart loads, the checking is usually done after the driver has gone. The checking cost, although a cost to the marketing system, is not borne by the distributor.

The methods and costs for checking orders at seven food distribution warehouses in the United States will be used as the basis of discussion in this section.

At the first distribution warehouse, the complete (100 percent) item identification was conducted for a substantial portion of the orders shipped. All items were checked at the dock and then were dead-pile-loaded into delivery vehicles. The cost for order checking amounted to 1.428 man-hours per 1,000 cases shipped. In addition to checking orders at the warehouse, a complete piece count was conducted as cases were unloaded via roller conveyor. The piece count was verified at every 25th case. The added cost of the complete piece count at retail stores while unloading was very minimal.

At the second distribution warehouse, a complete (100 percent) piece count was conducted at the dock before loading the delivery vehicle. The cost for order checking amounted to 1.00 man-hour per 1,000 cases shipped. The cart loading and unloading methods were used and no other checking was conducted during the unloading operation at the retail store.

At the third distribution warehouse, both item checking and piece counting were combined. Of the completed orders, 5 percent were checked by item checking and 10 percent by piece counting. The cost for checking orders at this distribution warehouse amounted to 0.195 man-hour per 1,000 cases shipped. Products were shipped on carts and pallets, and orders were not checked during unloading at retail stores.

At the fourth distribution warehouse, where one complete delivery vehicle load for every 75 loads shipped is segregated, the pallet loads were broken down and the total load piece counted. A 1.3 percent sample of 300 cases per man-hour equals 0.043 man-hour (2.6 minutes) per 1,000 cases shipped. The percentage of errors found in this check is used as a control for credits issued to retail stores. In addition to order checking at the distribution warehouse, 25 percent of the loads are unloaded case by case at retail stores and counted by the driver and a retail store employee (count verification at every 25th case). The remaining 75 percent of the deliveries are checked by store personnel only.

At the fifth distribution warehouse, order checking is limited to only problem stores and to an occasional spot check. At retail stores serviced

from this distribution warehouse, 80 percent of the deliveries are unloaded case by case and counted by the driver and a retail store employee with count verification after every 25th case. The remaining 20 percent of the deliveries are unloaded as unit pallet loads, and no checking is done while the delivery vehicle driver is at the store. Experience has shown that fewer credits are issued for selection errors with pallet load deliveries than with deliveries unloaded case by case.

At the sixth distribution warehouse, a daily random sample audit of assembled store orders is conducted. Based on the results of the audit, stores are issued credit for warehouse selection errors. During the audit, orders are counted and checked for selection errors. An average weekly sample audit ranges from 5 to 10 percent of the total weekly shipments. The audits are conducted by each department—dry grocery, frozen, dairy, deli, and produce.

An independent group working for the Accounting Department conducts the audit and issues a weekly summary of the sample audits. A record of the 12-week rolling average of sample results is maintained. Each store receives credit based on the overall net errors times the average case cost. The credits are allocated with each department having its own average case cost and volume. The exceptions to the above-discussed credit arrangement are (1) stores that report missing pallet loads or high value items or (2) if an order is misplaced or lost. When one of the exceptions occurs, stores are granted actual credit amounts in addition to the amount of credit granted on the basis of average errors and item costs. The cost of order checking (5-percent sample identification) in this distribution warehouse amounted to 0.05 man-hour per 1,000 cases shipped.

At the seventh distribution warehouse, auditors out of the company's controller office checked selectors' accuracy to determine that: (1) Correct quantities are selected for shipping; (2) correct items are selected (misselections); and (3) all no-stocks listed were valid (warehouse scratches). The warehouse auditors forward copies of their reports to department heads and a record of the errors found by a selector to the warehouse superintendent each day. The shipping errors are averaged every 4 weeks and are shown as a net shortage per 1,000 cases shipped. Automatic credits are issued to stores based on the percentage of errors found in each 4-week period. Individual stores receive credit based on the number of cases shipped to the store and an average case value. The amount of random sample spot checking conducted was based on the number of errors found. During a representative 4-week period, checking amounted to a 1-percent sample for piece counting and a 0.35-percent sample for item identification. The warehouse cost for checking was 0.027 man-hour per 1,000 cases shipped.

To this point warehouse labor costs for checking orders have been stated in man-hour increments. Man-hour increments were used for labor costs because there are regional differences in warehouse labor costs. However, to give an indication of potential cost differences between the order checking procedures in the seven distribution warehouses average labor cost of $9 per hour (including fringes) have been used (table 1).

TABLE 1.—Labor costs for various methods of checking orders at seven food distribution warehouses

Method of checking orders	Costs of checking orders per 1,000 cases shipped	
	Man-hours	Dollars
100-percent item identification	1.428	12.86
100-percent piece count	1.000	9.00
5-percent sample item identification and 10-percent sample piece count	.195	1.80
1.3-percent sample piece count after breaking down of unit pallet loads	.043	.39
No checking-except problem stores on minimal basis	(2/)	(2/)
5-percent sample piece count	.050	.45
0.35-percent sample item identification and 1-percent sample piece count	.027	.24

1/ Based on labor costs including fringes amounting to $9 per hour.
2/ None.

Comparing the labor costs for checking orders at the seven distribution warehouses that had checking costs shows the difference between the highest cost (100-percent item identification) and the lowest cost (0.35-sample identification and 1-percent sample piece count) amounts to 1.401 man-hours or $12.62 per 1,000 cases shipped. For the typical distribution warehouse shipping 200,000 cases per week, the cost difference would amount to 14,570 man-hours or $131,130 per year.

CONCLUSIONS

Based on the discussion and analysis of material in this report the following conclusions can be drawn:

- Shipping error control for food distribution warehousing firms is similar to quality control as used in most manufacturing firms.
- There are three types of shipping errors occurring most often—shortages, overages, and mis-selection.

- The causes of shipping errors that occur most often are poorly trained warehousemen and supervisors, an overemphasis on quantity rather than quality of production; poorly prepared documents provided to order selectors; improper pallet "let-down" policy or performance of forklift operators; merchandise placed in the wrong selection slot; and inadequate lighting.

- Shipping errors will never be completely eliminated but their major causes are controllable.

- Checking orders (verification of accuracy) is the method used to correct shipping errors.

- There are five procedures used to check orders at a food distribution warehouse—complete item check, partial item check, complete piece count, partial piece count, and no checking.

- Order checking is an added cost and does not reduce errors made during order selecting.

- Order checking should be used to measure the percentage of errors being made; show which selector is making the errors; give facts that can be used in determining the causes for the errors being made; make possible the correction of the error so that a corrected shipment is made; keep control of credits issued to retail stores covering errors found or claimed at the retail level; and help control "delivery shrink" (products lost during delivery).

- Order checking should be kept to a minimum.

RECOMMENDATIONS

Based upon the material presented, the following recommendations can be made:

- Determine the reasons for shipping errors and correct the errors to secure selection accuracy.

- Check orders at the warehouse on a quality control basis and structure the quality control by:

  - Setting the range of quality required (be realistic and not idealistic).

  - Taking a random sample.

  - Varying the size of the sample (percentage of total shipments) with the degree of error—the larger the number of errors, the larger the sample.

    - Determining the cause of current errors and taking preventive action.

- Make arrangements with retail stores so that credits for errors are based on the percentage of errors found in the quality control procedure.

- The cost of checking orders must never exceed the value of the errors found.